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March Madness: NCAA Tournament Participation and College Alcohol Use

Dustin R. White
University of Nebraska at Omaha, drwhite@unomaha.edu

Benjamin W. Cowan
Washington State University, ben.cowan@wsu.edu

Jadrian J. Wooten
The Pennsylvania State University, jjw27@psu.edu

CONTEMPORARY ECONOMIC POLICY

MARCH MADNESS: NCAA TOURNAMENT PARTICIPATION AND COLLEGE ALCOHOL USE

DUSTIN R. WHITE, BENJAMIN W. COWAN and JADRIAN J. WOOTEN*

While athletic success may improve the visibility of a university to prospective students and thereby benefit the school, it may also increase risky behavior in the current student body. Using the Harvard School of Public Health College Alcohol Study, we find that a school's participation in the NCAA Basketball Tournament is associated with a 47% increase in binge drinking by male students at that school. Additionally, we find evidence that drunk driving increases by 5% among all students during the tournament. (*JEL* I12, I23, Z28)

I. INTRODUCTION

Alcohol consumption is one of the primary public health concerns on college campuses in the United States (NIH-NIAAA 2016; theAmethyst-Initiative.org 2015). Of particular concern is the amount of binge drinking—defined as five or more drinks at one time—among students. Binge drinking is associated with increased rates of drunk driving, sexual assault, and other negative outcomes among young people (Miller et al. 2007). A survey conducted by Glassman et al. (2010) revealed that 16% of respondents aged 18–24 consumed *more than double the binge drinking threshold* on college football game days and that 36% of respondents reported binge drinking during game day festivities.

Studies of alcohol consumption associated with athletic events have been conducted previously, but these focus almost entirely on a single occasion or a single school (Neal et al. 2005; Neal and Fromme 2007). In this paper, we explore the impact of the NCAA Men's Basketball Tournament on student alcohol consumption during the 1993, 1997, 1999, and 2001 seasons at more than 40 schools using the Harvard School of Public Health College Alcohol Study (CAS). We isolate the effect of tournament participation on student alcohol consumption by examining how patterns of consumption change around the tournament for schools that do and do not participate in a given year.

Intercollegiate athletics have played a part in the college experience for more than a century; currently, over 1,200 colleges and universities are members of the National Collegiate Athletic Association (NCAA 2010). The broadcast rights deal signed by the NCAA for the Division I Men's Basketball tournament ($10.8 billion over 14 years) provides proof of the tremendous demand both on and off campus for college basketball (O'Toole 2010). The increasing popularity of intercollegiate athletics—particularly football and men's basketball—drives universities to invest more in their athletic programs each year (Berkowitz 2014).

Athletic programs have the potential to increase the exposure of an institution and thereby increase the quality of applicants to their school. Toma and Cross (1998) find that winning a national championship in either men's basketball or football increases the number of

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White: Assistant Professor, Economics, University of Nebraska at Omaha, Omaha, NE 68182. Phone 402-554-3303, Fax 402-554-2853, E-mail drwhite@unomaha.edu

Cowan: Associate Professor, Economics, Washington State University, Pullman, WA 99164; NBER, Cambridge, MA 02138. Phone 509-335-2184, Fax 509-335-1173, E-mail ben.cowan@wsu.edu

Wooten: Assistant Teaching Professor of Economics, Economics, The Pennsylvania State University, University Park, PA 16802. Phone 814-865-7352, Fax 814-863-4775, E-mail jjw27@psu.edu

ABBREVIATIONS

CAS: College Alcohol Study
DD: Difference-in-Differences
GPA: Grade Point Average
NCAA: National Collegiate Athletic Association

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applicants to a school, and that these increases were both absolute and relative to peer institutions. Pope and Pope (2009, 2014) find that improved performance in football or basketball in a given year can increase the number of Scholastic Assessment Test scores submitted to a school by up to 10%. A larger pool of applicants allows a school to be more selective when making admissions decisions.

Lindo, Swensen, and Waddell (2012) examine variation over time in athletic performance of football teams at the University of Oregon and find that academic performance suffers during years in which the team performs exceptionally well. This difference is most pronounced among males. Responses to a student survey in Lindo, Swensen, and Waddell (2012) suggest that alcohol consumption plays a role in the decline of grades. This agrees with previous results that find alcohol consumption is associated with worse grades among students and that peer effects are particularly influential in determining the extent of consumption among college students (Eisenberg, Golberstein, and Whitlock 2014; Lindo, Swensen, and Waddell 2013). In a follow-up article, Hernández-Julián and Rotthoff (2014) confirm the findings of Lindo, Swensen, and Waddell (2012) by observing a similar effect at Clemson University, although they find that females suffer a larger decrease in academic performance. While better athletic performance may have a positive effect for the university in terms of donations and improving the quality of future classes, there appears to be an adverse effect on the current student body.

More recently, Lindo, Siminski, and Swensen (2018) investigate the incidence of sexual assault on college football game days. They find that reported sexual assaults increase significantly surrounding these events and that alcohol-related arrests rise as well. The authors suggest that increased alcohol consumption and a college party culture are the primary drivers of the spike in the incidence of sexual assault surrounding college football games.

In this paper, we examine self-reported alcohol use during a major college sporting event at schools that do and do not participate in the tournament in a given year using a difference-in-differences (DD) framework. We are thus able to study a direct link between college sports and drinking. Furthermore, while previous papers have largely focused on college football, we examine the effects of a post-season basketball tournament that involves many schools simultaneously and takes place in the spring rather than the fall.[1]

Identification in our paper is established by comparing the change in drinking that occurs among students at participating (treatment) schools during the time of the tournament (mid-March to early April in our sample years) to any change that occurs at nonparticipating (control) schools around that time. Thus, time-invariant differences in alcohol use across schools by participation status as well as seasonal changes in drinking that are common to all college students are "differenced out" of our estimated treatment effect.

In the next section of this paper, we present our empirical model to estimate the impact of NCAA tournament participation and games on alcohol consumption. We then provide a summary of the data used in our analysis. In the results section, we show that tournament participation increases the binge drinking rate of male students by approximately 47% (relative to the average binge rate among males at tournament schools). Furthermore, we find that students are more likely to self-report drunk driving during the tournament. We conclude by considering the meaning of these results and their policy implications.

II. EMPIRICAL MODEL

The NCAA Men's Basketball Tournament extends the basketball season for participating teams by up to six games during the years studied in this paper. The winner of the tournament is deemed the national champion for that season.[2] These games are watched or attended by tens of millions of fans.[3] For college students, if alcohol consumption is in fact complementary to viewing or attending (important) games by the college's team (as is suggested by Lindo, Swensen, and Waddell 2012), then drinking among students will rise when the school's team participates in tournament games.

Using reports of alcohol consumption taking place between January and May in each of

1. This is a necessity of working with the CAS data, as surveys are collected each spring.

2. Information on the selection of participating teams can be found at http://www.ncaa.com/content/di-principles-and-procedures-selection

3. In our sample years, television viewership for the national championship game alone was between 23 and 33 million people: http://www.sportsmediawatch.com/ncaa-final-four-ratings-history-most-watched-games-cbs-tbs-nbc/

our sample years, we can observe alcohol consumption of students during the NCAA tournament. We exploit both time differences (whether a respondent's survey covers the time period for the tournament) as well as school differences (whether the respondent was attending a tournament school in that year) in a DD framework to identify the effect of NCAA tournament participation by an individual's institution on their alcohol consumption.

Our regression model is expressed as follows:

$$D_{ismy} = \beta_0 + \beta_1 \bullet \text{treated}_{ismy} + \gamma_{sy} + \mu_m + \lambda \bullet X_{ismy} + \epsilon_{ismy}$$

D represents the drinking behavior of interest, and i, s, m, and y are indices for individual, school, month, and year, respectively. We focus primarily on the number of occasions that an individual binged (measured as at least five drinks at one time) over a 2-week period, but consider other measures of alcohol use as well.

Our treatment variable, treated_{ismy}, is a binary variable that is equal to one if the individual's retrospective survey covers the date(s) of one or more games played by their school team in the tournament that year and is zero otherwise. Thus, it is zero for individuals attending schools that did not participate in the tournament in a given year as well as for individuals attending tournament schools but whose survey did not cover any of that school's tournament games. μ_m represents month fixed effects, and γ_{sy} represents school by year fixed effects that account for school-specific trends across years. X_{ismy} is the vector of all other individual and school explanatory variables, and ϵ_{ismy} is a disturbance term.

Our main parameter of interest, β_1, is identified through any change in drinking that occurs in tournament schools during the time of the tournament compared to other times within the year, all relative to the same difference at nontournament schools.[4]

Time-invariant differences in alcohol consumption by institution are not a threat to identification: if students at tournament schools tend to drink more than students at nontournament schools, but this difference does not change during the tournament, we will fail to reject the hypothesis that $\beta_1 = 0$, and the difference will be reflected in the school-year fixed effects. Similarly, seasonal changes in drinking behavior across all schools cannot account for a positive β_1, since those changes will be absorbed by the month fixed effects. We note that student drinking could rise during spring break (when school is out), but we do not observe that tournament schools are more likely to hold their spring break during the time of the tournament.[5]

X_{ismy} includes factors that are commonly associated with alcohol consumption by college students, according to Glassman et al. (2010): race, gender, age, membership in a fraternity or sorority, and year in school. X_{ismy} also includes measures of grade point average (GPA), marital status, men's basketball regular season win percentage, and athletic conference (because conference affiliation varies for some teams during our study period, it is not collinear with school fixed effects). As we show in the results section, the inclusion of these variables makes little difference in our estimates of interest.

III. DATA

We use the Harvard School of Public Health CAS to examine the relationship between college basketball postseason play and the amount of alcohol consumed by an institution's student body. CAS constitutes a nationally representative sample of full-time college students attending 4-year institutions in 1993, 1997, 1999, and 2001.[6] Forty-one of the institutions in the data participated in NCAA Division I athletics during the sample frame; students from these institutions make up the sample used for this paper. The names of the schools included in our sample can be found in Table A1 of Appendix S1, Supporting Information. In each year, CAS students were sent a mail survey, which included a series of questions regarding alcohol and other drug use,

4. We include a full set of month effects in our model rather than an indicator for "during tournament." We also performed specifications with unique dummies for all month-year pairs as a robustness check (the results are very similar to those of our baseline model; see Section IV.C).

5. In 2015, 79% of spring breaks across 529 institutions occurred entirely within the month of March and 97% overlapped March (STSTravel 2014). Though we do not know the spring break dates of all the school-year pairs in our data, we think it is unlikely that schools schedule spring break to overlap the NCAA tournament from year to year. Thus, our analysis in Section IV.C is unlikely to be biased by any differences in spring break dates by tournament status, and we provide alternative specifications to support this opinion.

6. For details on the survey design, see Wechsler et al. (2002). Cowan and White (2015) provide a comparison of CAS with Monitoring the Future and the National Longitudinal Survey of Youth (1997 cohort), and find similar drinking patterns and other characteristics of college students across the data sources.

TABLE 1
Mean Characteristics for Students and Schools by Tournament Status

Characteristics	Nontournament Colleges	Tournament Colleges	Nontournament Respondents	Tournament Respondents
Number of binge occasions in past 2 weeks	**1.370**	**1.526**	**1.477**	**1.812**
Drank last month	**0.651**	**0.697**	**0.709**	**0.632**
Number of drinks in past month	**24.142**	**27.234**	**26.078**	**33.980**
Survey overlaps any of college team's tournament games	**0**	**0.146**	**0**	**1**
Number of tournament games overlapped by survey	**0**	**0.235**	**0**	**1.606**
Men's basketball season win percentage	**40.617**	**67.586**	**67.832**	**66.156**
Age	**21.043**	**20.676**	20.685	20.627
Belongs to fraternity/sorority	**0.153**	**0.207**	0.210	0.190
Married	**0.098**	**0.068**	0.069	0.060
Female	0.577	0.576	0.575	0.584
1993 respondent	**0.268**	**0.591**	**0.671**	**0.125**
1997 respondent	**0.315**	**0.115**	**0.054**	**0.471**
1999 respondent	**0.297**	**0.230**	**0.216**	**0.315**
2001 respondent	**0.121**	**0.064**	**0.060**	**0.089**
Freshman	**0.204**	**0.219**	0.216	0.236
Sophomore	**0.202**	**0.217**	0.213	0.238
Junior	0.248	0.237	0.238	0.229
Senior	0.236	0.228	0.231	0.209
White	**0.767**	**0.857**	**0.862**	**0.829**
Black	**0.064**	**0.036**	0.035	0.043
Asian	**0.075**	**0.048**	0.048	0.051
Other race	**0.093**	**0.059**	0.055	0.077
GPA	3.159	3.151	3.147	3.177
N	21,987	3,990	3,406	584

Notes: Bold values indicate that the difference in means is significant at the 5% level. Tournament respondents are those individuals whose survey overlaps at least one of their own institution's team's games in the NCAA tournament. Nontournament Respondents are individuals at Tournament Colleges whose survey covers dates either before or after the tournament. Students at Tournament Colleges attended institutions whose NCAA Division I Men's Basketball Team participated in that season's NCAA tournament. Students at Nontournament Colleges also attended institutions with an NCAA Division I Men's Basketball Team, but their team did not participate in the NCAA tournament in that year.

experiences in college, and limited demographic and family background information.

Of the 31,184 student observations attending Division I institutions, 25,977 have nonmissing values for all variables used in this paper.[7] This is our regression sample. Student surveys were distributed early in the year and returned over the next several months: 4,396 surveys were returned in February, 7,804 in March, 11,054 in April, and 2,527 in May, accounting for about 99% of our sample over the 4 years.

According to Table 1, the majority of respondents reporting during a year in which their school's team participated in the NCAA Tournament are surveyed in 1993 (approximately 60% of such responses). The bulk of nontournament responses occurred in the 1997 and 1999 surveys, simply due to the fact that fewer schools that participated in the CAS were invited to participate in the NCAA tournament during those survey years, especially in comparison to 1993. Because the primary response years for each type of respondent differ, it may also be that the response dates within years for each type of respondent also vary. Table 2 provides the average response date for tournament and nontournament school-years. There is certainly variation between the response dates, but the average response date for tournament respondents is within one standard deviation of the response date for nontournament respondents in each year (and the overall sample), mitigating concerns that there are systematic differences in response patterns between tournament and nontournament schools.

A limitation of our analysis is that we only know the date a survey was processed by CAS administrators; we do not know the exact dates on which individuals completed their survey. As

7. In order to determine that missing values are not more prevalent among tournament or nontournament schools, we calculate the number of observations with missing values for each group, and present those results in Table A2 of Appendix S1. Nontournament schools have a higher frequency of observations with missing values, with March responses (prior to the tournament) being the primary driver of this difference.

TABLE 2
Average Response Date by Year and Tournament Status

	1993	1997	1999	2001	Overall
Average response date — tournament school-years	March 5 (17 days)	April 30 (10 days)	April 2 (18 days)	April 12 (26 days)	March 17 (25 days)
Average response date — nontournament school-years	March 12 (21 days)	April 27 (19 days)	April 8 (23 days)	April 4 (27 days)	April 2 (26 days)

Note: Standard deviations are provided in parentheses.

a result, when questions refer to retrospective alcohol consumption—such as binge drinking over the previous 2 weeks—we do not know the exact period of time to which a student is referring.

In lieu of information on the dates over which each student is measuring their drinking, we assume that 4 weeks pass between the completion of the survey by the individual and its processing date. This accounts for any lag between the date a student filled out the survey and the date they mailed it, time spent in the mail, and any lag between receipt of the survey and its processing by CAS administrators. The question "How many times did you binge drink in the past 2 weeks?" would therefore be interpreted as "How many times did you binge drink between 28 and 42 days prior to the processing date of the survey?," and questions regarding drinking in the previous month would be interpreted with respect to the time period 28–58 days prior to the processing date.

Since the choice of a 4-week lag to estimate the dates of the retrospective drinking period is somewhat arbitrary, we also estimated our models using 2-, 3-, 5-, and 6-week lags. Figure 1 shows how our point estimate of interest (the effect of the tournament on binge drinking occasions) and corresponding confidence intervals change with the choice of lag. As seen in the figure, point estimates diminish as the lag is moved away from 4 weeks in either direction, with 2- and 6-week lags yielding a near-zero coefficient. Figures 2 and 3 show that this pattern holds among male respondents, but that the binge drinking behavior of female students appears to have no relationship to the tournament window.[8]

It is unfortunate that we cannot corroborate our assumption about the lag between survey completion and survey processing, especially because our results are sensitive to this assumption. In all years, there are many more responses received prior to the NCAA tournament than after it. It is comforting, however, to find that the results (for men) diminish symmetrically with a shorter or longer lag, since this means that shifting individuals who respond late to the survey into the "treatment" group does not produce a different result than shifting treatment toward individuals responding somewhat earlier. Thus, concerns about self-selection of response times and its own correlation with drinking behavior, even if that relationship is correlated with tournament school status, are diminished.

A. *Drinking Measures*

We focus on three drinking measures to evaluate the impact of the NCAA Men's Basketball Tournament on alcohol consumption patterns: (1) the number of binge drinking incidents reported in the past 2 weeks, (2) whether or not an individual reported drinking at all in the past month, and (3) the number of alcoholic beverages an individual reported consuming in the past month. Two of our dependent variables are quasi-continuous measures based on binned responses to questions regarding alcohol consumption, and the third dependent variable is a binary value based on these original measures.

Our measure of binge drinking is based on respondents' answer to the question "Think back

8. The following is a quote from Wechsler et al. (2002) regarding the mailing and collection of CAS surveys in all four survey years: "Following the same practice as that used in the 3 prior surveys, we mailed questionnaires directly to students beginning in February and sent 3 separate mailings within a minimum span of 3 weeks. The initial mailing consisted of a letter of invitation to participate in the study and a questionnaire. We followed this mailing with a reminder postcard and a separately mailed second questionnaire. Mailings were different for each school, and we scheduled them to avoid the period immediately preceding and following spring break to capture behavior that occurred on campus and to avoid responses that reflected behavior during spring vacation."

FIGURE 1
Varying the Response Lag (w/95% CI)

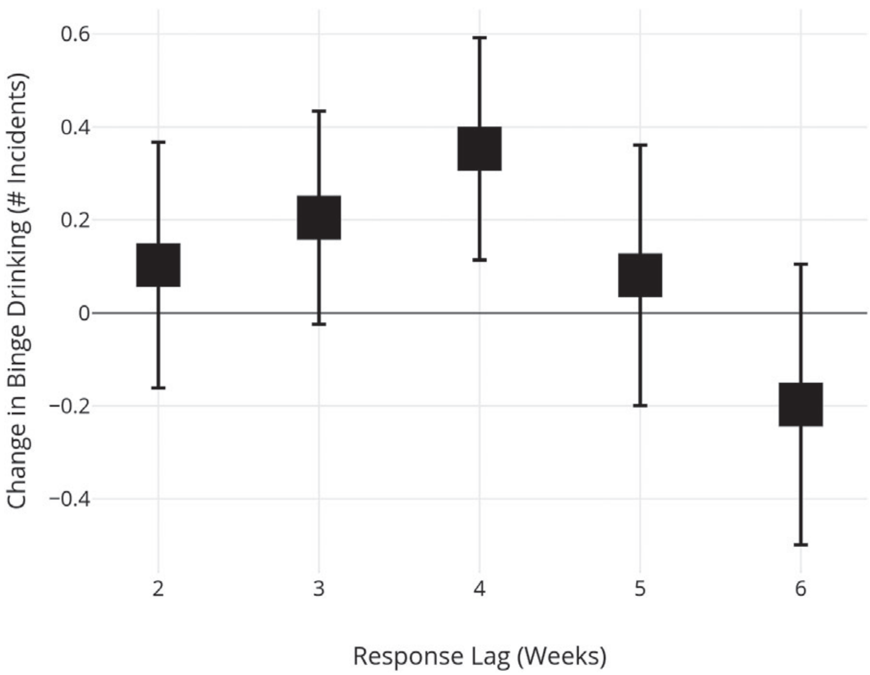


FIGURE 2
Varying the Response Lag among Male Respondents (w/95% CI)

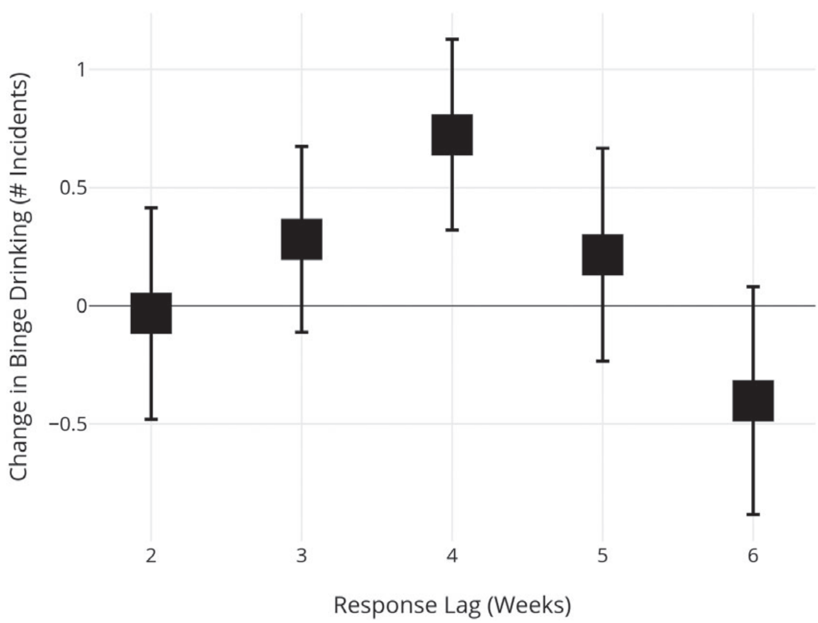
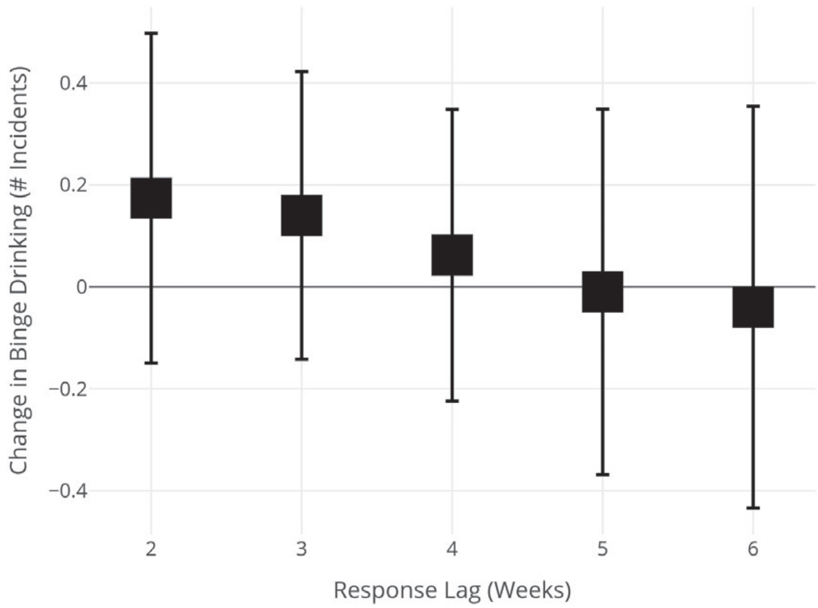


FIGURE 3
Varying the Response Lag among Female Respondents (w/95% CI)



over the last two weeks. How many times have you had five or more drinks in a row?" Potential answers are 0, 1, 2, 3 to 5, 6 to 9, and 10+ times. For answers with single values, that value is coded as the number of binge occasions in the past 2 weeks. For bins with multiple values, the midpoint is taken, and for individuals choosing the 10+ bin, a value of 10 binge occasions in the past 2 weeks is assigned.

The number of drinks consumed in the past month (30 days) is generated by combining the values of two questions. First, "On how many occasions have you had a drink of alcohol in the past 30 days?" Responses to this question were categorized as 0, 1 to 2, 3 to 5, 6 to 9, 10 to 19, 20 to 39, and 40+ occasions. Where bins were bounded, we coded the number as the midpoint value. When using the top code, a response was coded as 40 drinks. The next question, "In the past 30 days on the occasions when you drank alcohol, how many drinks did you usually have?" had possible responses of 1, 2, 3, 4, 5, 6, 7, 8, 9+ drinks per occasion. Only the top code needed clarification, and any response using the top code was assigned a value of 9 drinks per occasion. The number of drinks consumed in the past month was then calculated as the product of the number of days an individual drank in the past 30 days and the number of drinks an individual typically consumed when they did drink.

The binary variable indicating any alcohol consumption in the past month (30 days) is generated from the question about the number of occasions on which the respondent consumed alcohol. Where this value is 0, the binary variable is also 0; where the response was a value greater than 0, the binary variable was coded as 1.

B. *Preliminary Data Evaluation*

Summary statistics for variables included in our analysis by tournament school status (whether an individual's team participated in the tournament in that year, or not) are provided in Table 1. Students at tournament schools are more likely to have consumed alcohol and, on average, engaged in more drinking and binge drinking than students at nontournament schools. There are also significant differences in the demographics of these two groups, with students from tournament schools being whiter, younger, less frequently married, and more likely to be members of fraternities and sororities.

Table 1 also shows how respondents whose survey covers games played by their institution's

TABLE 3
Effects of Own-Institution NCAA Tournament Participation on Student Drinking Behaviors

	All Observations			**Males**			**Females**		
	Number of Binges	**Drink?**	**Number of Drinks**	**Number of Binges**	**Drink?**	**Number of Drinks**	**Number of Binges**	**Drink?**	**Number of Drinks**
Primary specification	0.353**	−0.001	5.041**	0.724**	0.037	10.947**	0.062	−0.031	0.645
(n = 25,438)	(0.122)	(0.020)	(1.331)	(0.206)	(0.031)	(4.046)	(0.146)	(0.027)	(1.923)
Including school*month FE's	0.334**	0.03	0.912	0.766**	0.069**	4.867	0.022	0.002	−2.288
(n = 25,438)	(0.121)	(0.017)	(1.061)	(0.205)	(0.026)	(3.177)	(0.144)	(0.023)	(1.576)
Including month*year FE's	0.297**	−0.04**	3.669**	0.596**	−0.007	7.179**	0.062	−0.064**	0.818
(n = 25,438)	(0.106)	(0.014)	(0.919)	(0.179)	(0.022)	(2.696)	(0.127)	(0.02)	(1.397)
Primary specification, tournament	0.209**	−0.001	2.919**	0.435**	0.023	6.985**	0.011	−0.024	−0.402
school subsample (n = 9,774)	(0.077)	(0.013)	(0.872)	(0.124)	(0.019)	(2.391)	(0.093)	(0.018)	(1.256)
Primary specification, including	0.321*	−0.009	5.682**	0.774**	0.046	12.713**	−0.04	−0.053	0.286
spring break (n = 22,970)	(0.138)	(0.022)	(1.417)	(0.23)	(0.034)	(4.187)	(0.165)	(0.03)	(2.148)

Notes: Standard errors are robust to heteroskedasticity and clustered at the institution level. Other controls included in the regressions but not shown include all those described in Section IV.A.
*Significant at the 5% level.
**Significant at the 1% level.

team in the tournament compare to other respondents at tournament schools (who returned their survey at different times of the year).[9] We actually see a lower probability of drinking among during-tournament respondents, but that is accompanied by more binge drinking and drinks over the past month, indicating that during-tournament respondents consume more alcohol conditional on drinking at all. Other than percentages of respondents by year (which indicates that responses covering the tournament were more common in some years than others), there are few significant differences across other variables between during-tournament respondents and other respondents at tournament schools. This assuages concerns that those who choose to return their survey at a date that indicates tournament overlap are selected on unobserved factors that are correlated with drinking behavior.

IV. RESULTS

A. *Primary Specification Regression Results*

The results from our primary regression analysis are presented in the first row of Table 3. All regressions are performed using ordinary least squares with robust standard errors clustered by school. Each column represents a different dependent variable (drinking measure).[10] Control variables for this specification include team win percentage, membership in a fraternity or sorority, marital status, gender, year in school, race, GPA, age, and fixed effects for athletic conference, month, and school-year interaction terms. Detailed regression results for our primary specification are presented in Table A3 of Appendix S1. "Treated" respondents attended a school that participated in the NCAA tournament during their survey year, *and* had surveys that covered the date(s) of at least one of their school team's tournament games.

We find that treatment raises the number of binge occasions in the past 2 weeks by roughly 0.35, or 23% at the mean for tournament schools.[11] The number of drinks in the past month rises by 5 (a 19% increase). Treatment appears to have no significant effect on the likelihood that students drank in the past month.

9. Table 1 indicates that the bulk of Tournament-observing respondents at tournament schools reported during the 1997 and 1999 surveys. According to the information provided by the surveyors in Wechsler et al. (2002), this is due primarily to randomness in the response rates of the surveyed individuals. This is unlikely to affect our results, since each specification will include year fixed effects to account for differences across time.

10. While not reported in the tables, our results are robust to using a binary measure of "binge drank in the past 2 weeks" as a dependent variable. These results are available upon request.

11. While the results presented in Table 3 employ linear models, the results are robust to using other estimation techniques. The results of negative binomial and logistic regression models are available in Table A6 of Appendix S1.

As presented in Table A3 of Appendix S1, other coefficients in our models are generally as expected: students who are members of fraternities and sororities drink more alcohol; married and female students drink less (DeSimone 2007). Freshmen are less likely to have drunk at all in the previous month but are more likely to binge. White students consume substantially more alcohol than "other race" students, who in turn consume more than black and Asian students. A higher GPA is associated with less drinking (according to any measure). Lastly, the fact that the men's basketball team regular season win percentage has little effect on drinking behaviors suggests that participation in the tournament, rather than the quality of the team itself, drives the observed increase in alcohol consumption.

B. *Effects by Gender*

When results are estimated on samples of men and women separately, stark differences emerge. As seen in Table 3, the measured increase in binge drinking and number of drinks consumed is concentrated almost exclusively among male students.

The observed increase in the number of binge drinking occasions in the past 2 weeks for men represents an approximately 47% increase at the mean among students at tournament schools (which is just under two binge occasions). Males report consuming almost 11 additional drinks in the past month when their college team participated in the tournament (a 40% increase at the mean). Because past and emerging research suggests that drinking surrounding sporting events is associated with highly negative outcomes, these results are important from a public health perspective (Lindo, Siminski, and Swensen 2018).

C. *Robustness*

In this subsection, we examine the robustness of our main results in several different ways.[12] We begin by examining how sensitive our treatment effect estimate is to the set of controls in the model.

The first three rows of Table 3 show, respectively, results from models including (1) the primary specification, which includes separate dummies for each school-year pair (school and year fixed effects are interacted), (2) interacted fixed effects for each school-month pair (interacting school and month rather than school and year fixed effects), and (3) interacted fixed effects for each year-month pair (interacting year and month rather than school and year fixed effects). The primary specification controls for the possibility that some schools experience a different trend in alcohol use over our sample years than others, which could be correlated with tournament status. The second accounts for the possibility of different seasonal variation between schools. The third is the most flexible way to account for differences in drinking over time (within and across years). Each specification affirms the results from our primary specification.

As discussed in Section II, a potential threat to the interpretation of our results is spring break, a time (usually a week) off from school given to students at most U.S. institutions, typically during the month of March. Spring break at many colleges likely coincides with part of the NCAA tournament, and alcohol use increases during spring break, particularly among males (Lee, Lewis, and Neighbors 2009).[13]

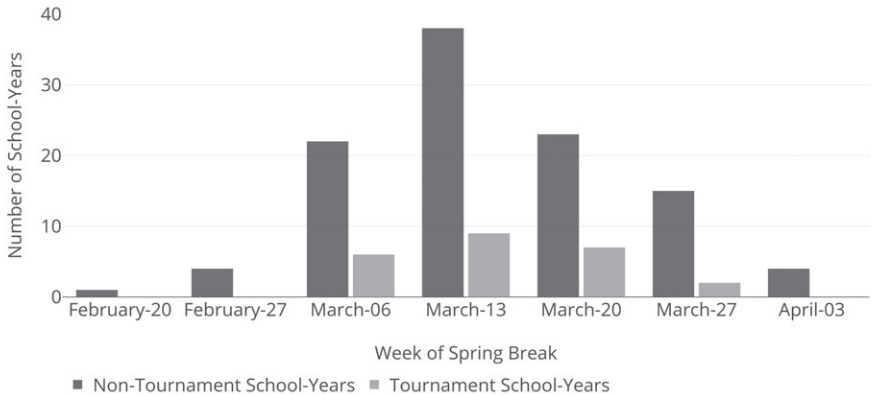
Because the vast majority of schools hold spring break during the month of March, we expect that any "spring break" effect on drinking is likely to be absorbed by the month effects in our model. This may confound our results if spring break is more likely to be scheduled over NCAA tournament dates at tournament schools than at nontournament schools. Since some schools consistently play in the tournament each year while others rarely do, it is possible that these teams schedule spring break during the tournament while others do not, which would challenge our ability to accurately estimate a treatment effect.

To counter this possibility, we estimate our model with only students from schools whose team plays in the tournament in at least 1 year of our data using only those students whose survey overlaps the tournament dates in a given year (thus, month effects are removed from the

12. In addition to the robustness tests described in this section, we also include results from a falsification analysis and analysis of various subgroups of schools in Table A4 of Appendix S1. Each of these analyses supports the generality of our findings above.

13. Another potential confounding factor in our analysis is the possibility that students do not consume more alcohol *overall* when they observe the NCAA tournament. It is possible that they instead change the time period during which they consume alcohol. In Table A7 of Appendix S1, we attempt to detect intertemporal substitution of alcohol consumption, and find little evidence that students consume less alcohol before or after the NCAA tournament in order to compensate for consumption during the tournament window.

FIGURE 4
Spring Break Dates by School-Year



model). Identification in this model comes from year-to-year variation in drinking at schools who reach the tournament in some years but not others. Because academic calendars are set well in advance of any invitation to participate in the NCAA tournament, we think it is highly unlikely that a college's spring break is more likely to occur during the tournament in years in which their team participates than in years in which they do not.

The results of this exercise are contained in the fourth row of Table 3. Treatment is again defined based on overlap with any tournament games (as in all other rows of the table). The point estimates are smaller in magnitude than in the primary specification, and some are less precisely estimated (owing to the much reduced sample size). The broad picture is remarkably similar, however: binge drinking and total drinking rise during the tournament when a student's own school team participates, and this effect is again focused on male students.

Finally, we successfully obtained detailed spring break dates during our study years from 34 schools,[14] in order to include a control for spring breaks in our regression analysis. A histogram of spring break dates by the tournament status of schools is presented in Figure 4, and shows that the spring break dates of schools participating in the NCAA tournament closely resemble the distribution of spring break dates for nonparticipating school-year observations.

In order to control for spring break in our regression analysis, we created a binary variable for whether or not the survey response window overlapped the school's reported spring break in respondents' survey year. The results of the specification including this measure can be found in the final row of Table 3. These estimates are nearly identical to our primary specification. The evidence of each of our specifications targeting potential interference resulting from the timing of spring break suggests that the effect of spring break on our measurement of alcohol consumption during the NCAA tournament is negligible.

D. *Effects of Individual Rounds*

In the first row of Table 4, the definition of treatment is changed from a binary variable indicating whether an individual's survey overlapped with any games played by their college team in the tournament to the *number* of the team's games (rounds) overlapped by the student's survey. The results are qualitatively and quantitatively consistent with those from our baseline treatment definition, since the average number of rounds a team plays in the tournament is a little less than two games.

The rest of the rows in Table 4 display the effects of overlapping exactly one round, two rounds, and three or more rounds separately (within the same regression). Though the increases are not perfectly monotonic in all cases, and some individual coefficients are no longer

14. Some schools indicated that they do not maintain archives of academic calendars that reach back 25 years, while others simply did not respond to our request for information when past academic calendars were unavailable online.

TABLE 4
Effects of Own-Institution NCAA Tournament Rounds on Student Drinking Behaviors, by Gender

	All Observations			Males			Females		
	Number of Binges	Drink?	Number of Drinks	Number of Binges	Drink?	Number of Drinks	Number of Binges	Drink?	Number of Drinks
Treated (number of rounds)	0.196*	−0.003	2.585**	0.414**	0.025	6.677**	−0.001	−0.031	−0.918
	(0.077)	(0.013)	(0.847)	(0.123)	(0.019)	(2.356)	(0.091)	(0.018)	(1.231)
One round observed	0.290*	−0.011	3.734*	0.520*	0.027	8.846	0.110	−0.039	−0.199
	(0.147)	(0.023)	(1.463)	(0.25)	(0.035)	(4.702)	(0.178)	(0.03)	(2.044)
Two rounds observed	0.303	0.039	8.311*	0.821*	0.059	13.921	−0.202	−0.002	2.437
	(0.231)	(0.049)	(3.537)	(0.389)	(0.071)	(8.526)	(0.267)	(0.07)	(6.815)
Three plus rounds observed	0.586	−0.01	4.301	1.139*	0.066	16.548	0.088	−0.092	−6.698
	(0.331)	(0.051)	(3.403)	(0.501)	(0.072)	(9.023)	(0.431)	(0.074)	(4.742)
N	25,438	25,438	25,438	10,845	10,845	10,845	14,593	14,593	14,593
R^2	.179	.124	.148	.165	.112	.129	.149	.132	.126

Notes: Standard errors are robust to heteroskedasticity and clustered at the institution level. Other controls included in the regressions but not shown include all those described in Section IV.A.
*Significant at the 5% level.
**Significant at the 1% level.

statistically significant at conventional levels, the broad pattern is that "dosage" matters: when an individual's survey overlaps more tournament games, they engage in more binge drinking and total drinking. As before, these effects are highly concentrated among male respondents.

E. Drunk Driving

Our last analysis deals with the question of whether the increase in drinking as a result of the tournament leads to behaviors that could cause harm to others. We are limited in the behaviors we can analyze given that many questions in CAS ask respondents about behaviors or experiences over the course of the past year (which is not well suited to our analysis of changes around tournament time). However, we are able to examine self-reported drunk driving and self-reports of riding in a car with a drunk driver over the past month. Table 5 shows the results of this analysis. In the first row, drunk driving and riding with a drunk driver are pooled together—the dependent variable is equal to one if the student reported either behavior in the previous month. The second row shows the results for drunk driving only, and Row 3 shows the results for riding with a drunk driver only.

Both males and females experience a roughly 4 percentage point increase in the probability of experiencing any kind of drunk driving episode (a 9.1% difference at the mean for males and a

TABLE 5
Effects of Own-Institution NCAA Tournament Participation on Drunk Driving Involvement

	All Observations	Males Only	Females Only
Self-reported drunk driving incident (*n* = 25,438)	0.038	0.036	0.038
	(0.022)	(0.034)	(0.029)
Self-reported driver (*n* = 25,438)	0.052*	0.047	0.053*
	(0.021)	(0.034)	(0.027)
Self-reported passenger (*n* = 25,438)	0.024	0.049	0.005
	(0.02)	(0.033)	(0.026)

Notes: Standard errors are robust to heteroskedasticity and clustered at the institution level. Other controls included in the regressions but not shown include all those described in Section IV.A. Self-reported drunk driving incidents are calculated based on responses to a question asking "In the past 30 days, how many times did you...," where the items related to drunk driving are "drive after drinking alcohol," "drive after having 5 or more drinks," and "ride with a driver who was drunk or high." For each item, respondents selected from options of "Not At All," "Once," and "Twice or More." The first two behaviors were combined to generate our measure of drunk driving, while the third behavior was used as our measure of riding with a drunk driver. Since we utilized a binary dependent variable in each case, the responses "Once" and "Twice or More" (to at least one question) triggered a value of 1, while "Not At All" triggered a value of 0. The value of the first row, measuring any drunk driving incidents was assigned a value of 1 if the response to any of the three questions is "Once" and "Twice or More," and was 0 otherwise.
*Significant at the 5% level.
**Significant at the 1% level.

13.9% difference for females). However, statistical significance in these models is weak; we only observe significant effects on the rate of drunk driving for the group as a whole, and for the female only group.

Overall, these results suggest that the increase in (binge) drinking occurring during the NCAA tournament among students at participating schools may in fact lead to behavior that is harmful to others, although there is too much noise to make this assertion with confidence. Future work with more focused information on student behavior during tournament time could measure how the tournament affects other problematic behaviors that are associated with alcohol use and abuse.

V. CONCLUSION

Athletic success presents many exciting opportunities for schools, but this paper adds to a growing body of research suggesting that participation and success in major sports is associated with increased binge drinking (and its associated negative consequences) among the current student body. Our findings suggest a large increase in binge drinking episodes reported by male students during the NCAA men's basketball tournament.

Determining how to combat the increase in drinking arising during the NCAA tournament among students at participating schools is beyond the scope of this paper. However, we note a few possibilities here. Given the enormous popularity of the NCAA tournament on and off campus, we believe that a dramatic change to the event itself is highly unlikely.[15] As such, college administrators and other interested parties might focus on interventions targeting the supply or demand of alcohol around major sporting events. For example, changing perceptions about what constitutes "normal" drinking (Haines and Spear 1996Perkins 2002) and providing motivational interventions (Borsari and Carey 2000) have been shown to reduce drinking (at least in the short run) in other contexts. Increase in law enforcement (surrounding underage drinking or drunk driving) during the tournament is another possibility. The difference in behavior between men and women suggests that the lowest cost intervention would be to target interventions at male students, since the increase in risky alcohol consumption observed during the tournament occurs among males.

15. It should be noted that a modest expansion in the number of tournament teams, from 64 to 68, has taken place in recent years. A large-scale expansion in the number of tournament teams is sometimes proposed (AP 2010). Our results suggest such a move would increase drinking around the tournament, though we cannot know for sure, since our data do not include such an expansion.

Intervention to reduce risky alcohol consumption becomes more urgent when considering the increased incidence of traffic fatalities surrounding major sporting events observed by Wood, McInnes, and Norton (2011). Interventions, such as the beer sales ban at the University of Colorado's Folsom Field in 1996, have also been demonstrated to reduce negative outcomes (Bormann and Stone 2001). Additional methods of intervention might include harm reduction through education (e.g., regarding sexual assault), ride services, or other means, administered just prior to or during the tournament itself. Future work might examine how these different policy options substitute for or complement each other and determine cost-effective ways to limit high levels of alcohol use and its consequences during the NCAA Men's Basketball Tournament.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix A1: NCAA Division I Schools Surveyed in the Harvard School of Public Health College Alcohol Study.

Appendix A2: Missing Values by Month and School Tournament Status.

Appendix A3: Effects of Own-institution NCAA Tournament Participation on Student Drinking Behaviors.

Appendix A4: Falsification Test of NCAA Tournament Participation on Student Drinking Behaviors.

Appendix A5: Effects of Own-institution NCAA Tournament Participation on Student Drinking Behaviors: Alternative Specifications.

Appendix A6: Effects of Own-institution NCAA Tournament Participation on Student Drinking Behaviors Using Count and Binary Models.

Appendix A7: Intertemporal Substitution of Alcohol Consumption Surrounding NCAA Tournament.